

## CLAIMS

1. A method of forming a read sensor for a magnetic head, comprising:  
forming a lift-off mask over a central region of a sensor layer, the lift-off mask  
5 comprising a hardmask layer over a release layer; and  
ion milling the sensor layer such that the end portions of the sensor layer are  
removed and a central portion of the sensor layer remains.

2. The method of claim 1, further comprising:  
10 depositing hard bias and lead layers adjacent to the central portion of the sensor  
layer; and  
dissolving the release layer to remove the lift-off mask.

3. The method of claim 1, wherein the hardmask layer comprises one of  
15 silicon, titanium, and tantalum.

4. The method of claim 1, wherein the release layer comprises one of metal  
and polydimethylglutarimide (PMGI).

20 5. The method of 1, wherein the act of forming the lift-off mask comprises:  
forming an initial multi-layer structure over the sensor layer, the initial multi-  
layer structure comprising a photoresist layer over the hardmask and release layers;

imaging and developing the photoresist layer such that end portions of the photoresist layer are removed and a central portion of the photoresist layer remains; and

etching the hardmask layer such that end portions of the hardmask layer are removed and a central portion of the hardmask layer remains.

6. The method of claim 5, wherein the act of etching the hardmask layer comprises reactive ion etching.

7. The method of claim 5, comprising the further acts of:  
removing the central portion of the photoresist layer; and  
etching the release layer such that end portions of the release layer are removed and a central portion of the release layer remains.

8. The method of claim 7, wherein the acts of etching the hardmask and release layers comprise reactive ion etching.

9. A method of forming a read sensor for a magnetic head, comprising:  
forming a release layer over a sensor layer;  
forming a hardmask layer over the release layer;  
forming a photoresist layer over the hardmask layer;

imaging and developing the photoresist layer such that end portions of the photoresist layer are removed and a central portion of the photoresist layer remains;

etching the hardmask layer such that end portions of the hardmask layer are removed and a central portion of the hardmask layer remains;

5 stripping the central portion of the photoresist layer; and

etching the release layer such that end portions of the release layer are removed and a central portion of the release layer remains, to thereby produce a lift-off mask comprising the central portions of the hardmask and release layers.

10 10. The method of claim 9, further comprising:

ion milling the sensor layer such that end portions of the sensor layer are removed and a central portion of the sensor layer remains;

forming hard bias and lead layers adjacent to the central portion of the sensor layer; and

15 dissolving the release layer to remove the lift-off mask.

11. The method of claim 9, wherein the hardmask layer comprises one of silicon, titanium, and tantalum.

20 12. The method of claim 9, wherein the release layer comprises one of metal and polydimethylglutarimide (PMGI).

13. The method of claim 9, wherein the act of etching the hardmask layer comprises reactive ion etching.

14. The method of claim 10, wherein the acts of etching the hardmask and  
5 release layers comprise reactive ion etching.

15. The method of claim 9, wherein the act of etching the release layer comprises wet-etching.

16. A magnetic head having a read sensor which is made by forming a lift-off  
10 mask over a central region of a sensor layer and then ion milling the sensor layer such that the end portions of the sensor layer are removed and a central portion of the sensor layer remains, the lift-off mask comprising a hardmask layer formed over a release layer.

17. The magnetic head of claim 16, wherein the read sensor is further made by  
15 depositing hard bias and lead layers adjacent to the central portion of the sensor layer and then dissolving the release layer to remove the lift-off mask.

18. The magnetic head of claim 16, wherein the forming of the lift-off mask  
20 involves forming an initial multi-layer structure over the sensor layer which comprises a photoresist layer over the hardmask and release layers; imaging and developing the

photoresist layer such that end portions of the photoresist layer are removed and a central portion of the photoresist layer remains; etching the hardmask layer such that end portions of the hardmask layer are removed and a central portion of the hardmask layer remains; removing the central portion of the photoresist layer; and etching the release layer such that end portions of the release layer are removed and a central portion of the release layer remains.

19. The magnetic head of claim 16, wherein the hardmask layer comprises one of silicon, titanium, and tantalum, and the etching of the hardmask layer comprises reactive ion etching.

20. The magnetic head of claim 16, wherein the release layer comprises one of metal and polydimethylglutarimide (PMGI).